MONTHLY WEATHER REVIEW,

SEPTEMBER, 1875.

WAR DEPARTMENT,

Office of the Chief Signal Officer,

DIVISION OF

TELEGRAMS AND REPORTS FOR THE BENEFIT OF COMMERCE AND AGRICULTURE.

INTRODUCTION.

In the preparation of this general review of the meteorological conditions which obtained in the United States and adjoining territories during the past month, meteorological reports from the following sources have been recorded and carefully examined at this office: Signal Service, U. S. A., 96 stations; United States Army post surgeons, forwarded by the Surgeon General, 39; Canadian meteorological service, 13; regular volunteer observers, 251; these latter reports have been particularly valuable in the preparation of the accompanying Rain Chart. In addition to the above, marine reports have been received, which have served to determine the course and extent of storms beyond the region of permanent stations. The most noticeable meteorological features of the month are—

First The violent cyclone, which passed to the westward over the West Indies, and thence to the coast of Texas, causing great loss of life and destruction of property, and furnishing one of the most perfect types of a tropical storm originating in the lower latitudes, and passing into the region of the temperate zone, the centre of disturbance describing approximately a parabola, the axis of which may be said to coincide with the northern limit of the trade-winds, and the vertex or most westerly portion of the curve being located near Galveston. This storm is referred to in the text under the head of Low Barometers, and is marked as No. III on the chart of storm tracks.

Second. The low mean temperature of the month, which has averaged from one to four degrees below the mean in the several districts. This variation, though apparently slight, gives to the month its appreciable low temperature, a condition particularly unfavorable to the agricultural interests of those sections of the country requiring warm, dry weather for the maturing of the unusually late crops. Very early frosts have injured fruit and late corn in the Northwest, and sections of the Middle and New England States.

Third. The drouths which prevailed in sections of the Southern States, have been followed by heavy rains in the regions of the Gulf States and lower Mississippi valley, but dry and warm weather has continued in the southern portion of the South Atlantic States, and in the northern portion of Texas.

Fourth. The violent local storms which have occurred, especially in New Mexico and Colorado, and on the eastern slope of the Rocky mountains.

ATMOSPHERIC PRESSURE.

From an examination of Chart No. II, it will be seen that the area of high barometer now extends over the southern portion of the United States, from the south Atlantic coast westward to the lower Mississippi valley; and that the area of mean low barometer is in

the region of the lower St. Lawrence valley. A comparison with the corresponding chart of the July REVIEW, shows a rapid increase of pressure in the Mississippi valley and the Northwest, and that the area of mean low barometer has moved toward the Atlantic with unusual rapidity.

(1.) *Areas of High Barometer.*—These areas, observed within the limits of the United States during the month, approached from the northern and interior portion of the continent, moving toward the Atlantic with uniform progression in the interior, but with an apparent retardation after the centre had passed to the east of the coast-line. They have been accompanied by a depression of temperature ranging from five to twenty-five degrees below the mean, depending upon the latitude of the station.

No. I. This area is of particular interest, as its origin is distinctly marked within the limits of the United States. It was first enclosed by an isobarometric line of 30.10, which included the regions north of Tennessee and Virginia. During the 7th and 8th the barometer rose at the stations on the Atlantic coast, and the shifting of the winds to the east and south indicated that this area continued its southeasterly course.

No. II. The telegraphic reports received on the morning of September 9, indicated the advance of this area toward the Lake region from British America. It followed immediately depression No. II, accompanied by rain, and brisk and high northerly winds from the Missouri valley eastward over the Lake region. Heavy gales occurred in its southeast quadrant on Lakes Michigan, Erie and Huron, and in the St. Lawrence valley, causing loss of life and serious marine disasters. The path of the centre of this area lies to the north of the Lake region, and thence over the northern portion of the Middle States to the Atlantic. Its southern half, therefore, extended over the entire country east of the Rocky mountains, southward to the Gulf, and the cool weather which was experienced on the Atlantic coast between the 10th and 15th, occurred while these districts were in the western quadrants of this area.

No. III. A slight area of high barometer which moved from the Northwest over the Lake region between the 14th and 18th but not reaching the Atlantic coast and apparently disappearing under the influence of the cyclone. Frosts proving injurious to late crops occurred in Minnesota, Michigan, Wisconsin and the northern portions of Illinois and Iowa whilst this area was central in the Northwest.

No. IV passed from British America southeastward to the South Atlantic, extending over the entire country, causing the barometer to rise from two to four-tenths above the mean in all the districts. Clear, cool weather prevailed generally from the 20th to the 24th, and frosts occurred in the northern districts.

(2.) *Areas of Low Barometer.*—The number of barometric depressions traced from the tri-daily reports received at this office during the month is, as in the two preceding months, less than in the corresponding months of previous years.

Chart No. I shows the track of each depression as determined from the consecutive reports after the definite progressive movement had commenced. Compared with those of the previous month the tracks in the northern portion of the country have a lower mean latitude and a general direction more directly to the east, passing to the Atlantic in the region of the St. Lawrence valley.

The disturbances in the southern portion of the United States have been unusually severe, and resulted from storms which originated beyond the limits of the stations of observation. The records of previous years show that the most violent storms occurring in the United States have their origin in the Tropics, and that before reaching our stations they have a westerly movement.

No. I. First observed latitude 43° 30′, longitude 22° west from Washington; last observed latitude 48°, longitude 16° east of Washington; time of transit, 72 hours; hourly velocity, 23½ miles Reports received during September 1st, indicated the approach of this depression, but the centre was not located on the tri-daily weather maps until the afternoon of the 2nd, and then only approximately in the upper Missouri valley, near the eastern boundary of Dakota. The above-mentioned report indicated heavy rains in Minnesota and light rains in the Upper Lake region; the barometer at Bismarck reading 29.63, and at Yankton, 29.66. The rain-belt, attending this depression, extended from the Missouri valley eastward over the northern portion of New England and the Middle States and St. Lawrence valley during the 2nd, 3rd, 4th and 5th. As the storm approached the Atlantic coast, the gradient increased, and the winds became dangerous to shipping in the Gulf of St Lawrence.

No. II. First observed in latitude 44°, longitude 26° 30′ west; last observed in latitude 49°, longitude 9° east; time of transit, 48 hours; velocity per hour, 33 miles Reports from the Pacific coast and the northern stations of the Rocky mountains indicate that this depression had its origin in the north Pacific. It was at no time wholly within the limits of the stations, and its general form was that of an elongated ellipse, or trough extending toward the northeast, immediately in advance of the most extended area of high barometer of the month. The rains which followed were unusually heavy in the Lake region, where the storm became very violent on the morning of the 10th, causing disasters which resulted in serious loss of life. Wrecks were also reported in the Gulf of St. Lawrence, where the wind became unusually strong, after shifting to the north and west.

No. III. First observed latitude 13°, longitude 17° east; last observed latitude 38°, longitude 6° east; co-ordinate of the vertex of path, latitude 28° 30′, longitude 19° 30′ west; mean velocity per hour, 19 miles Although this storm is not traced on the chart further to the eastward than the western portion of Cuba, reports recently received indicate that it originated east of Barbadoes, where a severe tornado occurred on the morning of the 9th. Succeeding reports from the West India stations show great barometric disturbances in that region until the afternoon of the 12th, when the storm had reached the eastern portion of Cuba. On the 13th a violent hurricane occurred at Santiago de Cuba, and the barometer at Key West had fallen to 29.81, with a brisk northeast wind. By midnight the wind had increased to a northeast gale and the barometer had fallen to 29.74. The morning report of the 14th indicated that the centre of disturbance had passed to the westward of Key West and Havana. The succeeding tri-daily reports of the 15th and 16th show a continuous westerly movement of the centre, the progressive velocity being retarded as the storm approached the vertex of its path; from the afternoon of the 15th to the afternoon of the 17th its mean velocity being 8 miles per hour. During the slow progressive movement the velocity of rotation increased to 88 miles per hour, when the cups of the anemometer at Indianola were carried away. Full accounts have already appeared giving details of the loss of life and destruction of property caused by this storm, the most severe which has occurred in the United States since the establishment of the Signal Service. In the meteorological history of the country its parallel occurred between the 27th of September and the 10th of October, 1837. In Chart No. I it will be seen that the northern half of the curve passes directly to the northeast, cutting the coast line near Norfolk. During the easterly movement the centre of depression gradually changed to an elongated ellipse, and the velocity of rotation was materially retarded while the centre remained on the continent. It however left

the Atlantic coast, producing heavy gales and marine disasters on the Jersey coast. Recent reports from the Atlantic, considered in connection with the violent storms which prevailed north of Great Britain from seven to nine days after the storm left our coast, indicate that this depression may have crossed the Atlantic.

The following reports and observations are taken from the monthly journals of the Signal Service:

"Galveston, Septeber 17th.—Storm continues with increased violence; at 2 P. M, barometer reached its minimum, 29.038; maximum velocity of wind, 4:50 P. M., sixty miles, southwest and west.

September 16th,—Observer at Indianola reports: "Rain continued and storm increased to hurricane from northeast, accompanied by a disastrous inundation from he Bay. One hundred and seventy-six lives lost and three-fourths of the town swept away, causing a loss of upwards of one million dollars worth of property, a severance of communication with the outside world, and a total suspension of business. Highest registered velocity of wind 88 miles. estimated velocity 100. The following hourly observations were taken at Indianola on the 15th and 16th:

DATE.	BAROMETER.	THERMOMETER.	DIRECTION.	WIND-VEL.	WEATHER.
15th, 2 p. m	29.60	84	NE	40	Threatening.
3 "	29.73	83	N	36	Threatening.
4 "	29.70	82	N	40	Threatening.
5 "	29.70	76	N	38	Light rain.
6 "	29.68	76	N	41	Light rain.
7 "	29.70	75	N	40	Light rain.
8 "	29.68	75	NNE	48	Light rain.
9 "	29.66	75	NNE	53	Light rain.
10 "	29.63	74	NNE	56	Light rain.
11 "	29.59	74	NNE	58	Light rain.
12 m.	29.56	74	NNE	60	Light rain.
16th, 1 a. m	29.52	74	NNE	56	Light rain.
2 "	29.46	74	NNE	60	Heavy rain.
3 "	29.39	74	N	66	Light rain.
4 "	29.36	74	NNE	68	Heavy rain.
5 "	29.35	74	NNE	64	Heavy rain.
6 "	29.36	74	NE	58	Light rain.
7 "	29.34	75	NE	66	Heavy rain.
8 "	29.33	75	NE	56	Light rain.
9 "	29.31	75	NE	64	Light rain.
10 "	29.29	75	NE	60	Light rain.
11 "	29.22	75	NE	74	Light rain.
12 m.	29.17	75	NE	72	Light rain.
1 p. m	29.13	75	NE	72	Light rain.
2 "	29.06	75	NE	68	Light rain.
3 "	29.01	75	NE	72	Heavy rain.
4 "	28.95	75	NE	76	Heavy rain.
5 "	28.90	75	NE	82	Heavy rain.

During the continuance of this storm in the Gulf a secondary depression developed in the upper Mississippi valley and passed directly eastward to the Atlantic coast, causing high winds on the Lakes and near the New England coast. This depression was central in Maine on the 17th and disastrous storms occurred in the Gulf of St. Lawrence and the Gulf of Mexico on that day.

No. IV. Observed in the Northwest on the 17th, and first located in latitude 44°, longitude 14° west; last observed in latitude 45°, longitude 5° east; mean velocity per hour twenty-two and a half miles. This storm was central in Michigan when the cyclone was central in eastern Tennessee, but the two depressions remained distinct, the latter moving with greater velocity, disappearing to the east, while the former was central in the Lower Lake region on the morning of the 20th. Light rains preceded and followed this depression, and strong northwest winds occurred on Lakes Michigan and Erie during the night of the 19th. The occurrence of these secondary depressions in the vicinity of the cyclone greatly reduced the barometric gradient, and will account for the diminished force with which the latter passed over the continent.

No. V. The telegraphic reports of the 22d and 23d indicated that this depression extended to the Pacific coast, and that the track of its centre was to the north of the Lake region, bearing to the northeast towards Hudson's Bay.

No. VI. This is the approximate track of a local barometric disturbance in the Gulf of Mexico, which, though slight, was accompanied by very heavy rain on the coast, and dangerous winds in the Gulf on the 24th and 25th. Six inches of rain are reported at New Orleans and three inches at Mobile on the 25th The depression moved slowly to the east, south of the Gulf coast, on the 26th and 27th, and disappeared apparently under the influence of the high barometer, in the lower Mississippi valley without passing to the east of Florida. Heavy rains continued near the Gulf coast and in the southern portion of the South Atlantic States during the 26th and 27th.

No. VII. First observed in latitude 47°, longitude 57° west; last observed in latitude 47° 30′, longitude 7° 30′ east; time of transit, sixty-four hours; mean velocity, twenty-five miles per hour. It developed in the extreme Northwest, and moved in a southeasterly direction until it reached the southerly portion of the Upper Lake region on the morning of the 29th, after which its course changed to the northeast, following the general direction of the St. Lawrence valley, being felt as an area of cloud and light rain in the northern portion of the United States, and accompanied by high northerly and westerly winds on Lakes Erie and Michigan, the velocity of which, on the night of the 29th, exceeded thirty miles.

No. VIII. First observed in latitude 39° 30′, longitude 12° west; last observed in latitude 40°, longitude 1° west. This storm is of particular interest, as it developed within the limits of the United States, and moved directly to the east, after a rotary movement of the atmosphere had commenced. On the morning of the 1st of October it was central in eastern Pennsylvania, after which its course changed slightly to the north of east. The rainbelt accompanying this storm extended over the Lake region, southward to Tennessee, and thence eastward to the Atlantic coast.

(3.) *Local Storms.*—On the 1st gales were reported at Wyanet, Illinois, and at Independence, Iowa, many trees being blown down at the latter place. On the 3d a severe thunder-storm occurred twenty miles southwest of Abington, Ill., the lightning striking the house of Robert Meachum, killing four cows and one horse. This is regarded, in the vicinity, as the heaviest storm of the year. On the 5th gales were reported at Corning, Miss., and at Florida, Mass. On the 6th a thunder storm, accompanied by a high wind, passed over Penn Yan, New York. On the 7th and 8th at Belvidere, Illinois; on the 8th and 9th at Beloit, Wisconsin; on the 9th at Chicago and Keokuk; and on the 9th and 10th at Dubuque, heavy and destructive rain-storms were reported, producing overflows in the rivers and streams of the various neighborhoods on the 9th and 10th, and causing much destruction of property along the banks, bridges, &c. The amount of

rainfall during the storm at Beloit, Wisconsin, is reported over six inches, and at Belvidere, Illinois, nearly four inches. On the 10th at 5:30 p. m. at Las Cruces, New Mexico, a waterspout suddenly appeared in the hills one mile back of the town, toward the north, and passed over the town as a tall, dark column of water and dust, destroying buildings, &c., in less than ten minutes. The water in the streets was from four to five feet deep, and two hours later rain commeced and fell in torrents for several hours. One report of this disaster says "It was midnight before the flood abated, and this morning our town, which was yesterday one of the most flourishing in the Southwest, stands a mass of ruins sad to contemplate. It is impossible to estimate the value of property destroyed." On the night of the 9th a tornado spent its fury on Normal, Illinois, where two gales seemed to converge, demolishing a large brick house and severely injuring one person. Other buildings and barns were demolished, and at King's Mill, a few miles west of Bloomington, the storm cut a track through a maple grove, twisting and uprooting the trees. At Clinton one man was killed by lightning, and at La Fayette cars were blown off the track. On the 10th gales were reported at Newport Barracks, Kentucky; Milford, Delaware; Depauville, New York; Weldon, North Carolina; Carthagena, Ohio; West Charlotte, Vermont; on the 11th at Atlanta, Georgia; on the 16th at Atlanta, Georgia, and Carthagena, Ohio; on the 17th at Gardiner, Maine, and Brashear, Louisiana; on the 18th at Florida and Fall River, Massachusetts; on the 25th at Ringgold, Ohio; on the 29th at Carthagena, Ohio; and on the 30th at Florida, Massachusetts. During the night of the 18th and morning of the 19th Charleston, S. C., was visited by a heavy rain and wind storm, doing damage to trees, &c. On the 15th at 5:30 p. m. a heavy rain and hail storm, with high wind, passed over St. Anthony and Minneapolis, Minnesota. On the afternoon of the 21st a severe storm of wind, hail and rain was reported from the southwestern portion of New Mexico, extending from Bear Creek cañon, beyond the upper Mimbres, breaking down the largest trees and carrying them high in the air, the wind denuding the earth of every hing. Hail-stones as large as cups fell and covered the mountains, looking at a distance like snow; some stones are described as weighing over a pound. On the 24th a storm of hail, sleet and snow, was also reported from Santa Fé, N. M. On the 30th a severe wind storm passed near Fort Madison, Iowa, blowing down fences, unroofing houses, &c

TEMPERATURE OF THE AIR.

The distribution of mean temperatures for the month is indicated by the isothermal lines on chart.

No. I. The temperature table on the same chart gives the average for the various districts for the month, together with the average for September during a long series of years. The comparison shows that the weather has been cooler than usual in all the districts, and most particularly so in the St. Lawrence valley. This excess of cold is largely due, in the northern sections, to the areas of unusully high barometric pressure which have crossed the country, and, in the southern, to the prevailing northerly winds induced by the storms in the Gulf. The following are a few of the maximum temperatures of the month: Corsicana, Texas, 100°; Jacksonville, Fla., 98°; Augusta, Ga., Dodge City, Kan., and Montgomery, Ala., 97°; Shreveport, La., and Tybee, Ga., 96°; Indianola and Denison, Texas, and Wilmington, N. C., 95°. The minimum temperatures for the month occurred at the following stations: Mt. Washington, 15°; Pike's Peak, 17°; Pembina, Dak., 21°; Colorado Springs, Col., 27°; Cheyenne, W. T., and Breckenridge, Minn., 28°; Bismarck, Dak., 29°; Marquette, Mich., 30°; Wytheville, Va., and Yankton, Dak., 30°; Escanaba, Mich., North Platte, Neb., and Burlington, Vt. The

greatest range of temperature was 68° at Pembina, Dak., from 89° to 21°, and the least 20° at Key West, from 93° to 73°.

Frosts.—Light frosts occurred on the 10th in Minnesota; on the 11th in Iowa, Wisconsin, Michigan, Illinois, Indiana, Ohio, Pennsylvania, New York, New Jersey, and all of the New England States; on the 12th in New York and New England. Heavy and destructive frosts occurred on the 17th in Minnesota and on the 18th throughout the Northwest and the Upper Lake region, and lighter frosts on the same date in the Lower Lake region, the Middle States and New England. Late corn and other crops suffered severely at this time in many portions of these districts. From the 18th to the 26th inclusive frosts, more or less severe, were frequent in all that portion of the United States lying north of the 38th parallel. Light frost was reported from the vicinity of Vicksburg on the 19th, and from the mountainous regions of Virginia, Tennessee and the Carolinas, on the 27th and 28th.

PRECIPITATION.

Chart No. III shows, in a graphic manner, the monthly distribution of the rain-fall. The table upon the same, giving the average by districts, furnishes the means of comparing it with the average for many years. The rain-fall has been unusully heavy in the Gulf States, and particularly so in Texas and Louisiana, where more than double the normal quantity has fallen. A large excess is also given for the St. Lawrence valley. The deficiency of rain has been noticeably great in the Middle and South Atlantic States and in portions of the Ohio valley, Missouri, Kansas and Minnesota. In the remaining districts the amount of rain does not differ widely from the average for September.

Among the heavy rain-falls for the month may be noticed the following: Galveston, 18.41; Mt. Washington, 11.34; Key West, 10.60; Indianola, 10.65; Jackson, Miss., 8.54; Mobile, 8.52; Baton Rouge, La., 8 07; Shreveport, La., 8.02. At Galveston the rain-fall amounted to over six inches on two different days—the 16th and 25th.

Snow.—Snow fell on Pike's Peak on twelve days during the month. The first snow of the season fell on the 17th in the Adirondacks; on the 19th at Pembina, Dubuque and Oswego; 21st, at Denver and Escanaba; 22d, at Malone, N. Y., and on the 24th, at Santa Fé, N. M.

Hail.—Hail frequently fell with the snow on Pike's Peak during the month. Local hail-storms have also occurred as follows: 5th, at Houseville, N. Y.; 15th, at Minneapolis, Minn.; 19th, on Lake Erie and at Dubuque, Iowa; 20th, at La Crosse, Malone, Milwaukee, Marquette, Duluth, Traverse City, Mich., and Brownsville, Pa.; 21st, at Port Huron and Marquette; 22d, Bangor, Me., and Madison Barracks, N. Y.; 24th, at Santa Fé; 26th, at Wytheville, Va.; 30th, Buffalo, Fort Abercrombie, Dak; Rockford, Iowa; Danville, Ky., and Norfolk, Neb.

Rainy Days.—The number of days during the month on which rain in any quantity fell averages about as follows: New England, the Northwest and the Southern States, 10; Middle Atlantic States, Tennessee and the Ohio and Central Mississippi valleys, 7; Lake region, 13.

Cloudy Days.—The number of cloudy days (other than those on which rain fell) averages, in New England, 4; Middle Atlantic and Southern States and Lower Lake region, 3; the Ohio valley and the Northwest, 3.5; Upper Lake region, 4.5.

RELATIVE HUMIDITY.

The relative humidity for the month averages, on the New England, New Jersey and South Atlantic coasts, 75 per cent.; in the interior portions of the New England, Middle and Southern States, 70; on the Gulf coast, 78; Ohio valley, 67: Lower Lake region, 69; Upper Lake region and Northwest, 72. The lowest means are, as usual, reported from the Rocky mountain stations, being 64 per cent., at Colorado Springs; 57, at Cheyenne; 56, at Santa Fé; 51, at Denver, and 31, at Salt Lake City.

WINDS.

The prevailing winds for the month are shown by the arrows on Chart No. II. It will be seen that they are mostly from the northeast in the Gulf and South Atlantic States; from the south or southwest in the Northwest, the Middle Atlantic States and New England, while in Tennessee, the Ohio valley and the Lake region they vary from northwest to southwest. The total movement of the air during the month, independent of direction, averages, in New England, 4,810 miles; on the New Jersey coast, 7,750; in the Middle States, 4,410; south Atlantic coast, 5,115; Gulf coast, 6,800; interior of the Southern States, 2,890; Ohio valley, 3,640; Lower Lake region, 6,610; Upper Lake region, 6,800; Northwest, 5,190. The following are some of the largest total movements: Sandy Hook, 10,247 miles; Cape Hatteras, 10,243; Galveston 9,300; Cleveland, 8,928; Erie, 8,351; Pike's Peak, 8,136; Peck's Beach, 8,124. The smallest movements occurred at the following stations: Lynchburg, 2,014 miles; Nashville, 2,316; Augusta, 2,414; Albany, 2,639; Vicksburg, 2,731; Shreveport, 2,863; Cairo, 2,883.

TEMPERATURE OF THE WATER.

A table of the maximum and minimum temperatures of water for the month at the different stations on the coast, lakes and rivers, will be found on Chart No. II. A comparison of the mean temperatures of water with those of the air shows that at nearly all points the air has been much cooler than the water at the corresponding points. On the coast of Maine, however, the reverse is the case, the air temperatures averaging three degrees higher than the water temperatures. In the Upper Lake region the two have been nearly equal. On the Atlantic coast, from Cape Cod to Florida, the water has been about three degrees warmer than the air, and on the Gulf coast two degrees, while along the western rivers this difference amounts to an average of five degrees, and on Lake Erie, seven.

NAVIGATION.

On Chart No. III will be found a table giving the highest and lowest water-marks, with the dates on which they occurred, at the stations on the principal Western rivers. The Red river rose steadily at Shreveport from the 10th to the 20th, after which it declined slowly. The Missouri fell almost continuously after the first few days of the month, but the depth of water has remained sufficient for navigation. The rise, which began in the upper Mississippi in August, continued until about the middle of September, the freshet-wave gradually extending itself downward, until its crest reached Memphis on the 27th. At Vicksburg and New Orleans the high water of August steadily subsided until towards the close of the month, when a slight rise occurred. The Ohio remained low during the month, changing but little. A rise of ten feet was experienced in the Cumberland, at Nashville, on the 21st, but the water subsided rapidly during the

week following. Navigation was resumed over the rapids in the Mississippi near Keokuk early in the month, and no reports concerning interruption of navigation, owing to low water, have been received from other points.

VERIFICATIONS.

The usual comparison of the "Probabilities" with the succeeding three tri-daily reports shows that on an average, in the United States, 87.82 per cent. of the predictions have been fully verified. The percentage of verificatons in the various districts is as follows: New England, 90.76 per cent.; Middle States, 89.92; South Atlantic, 86.94; Eastern Gulf, 84.72; West Gulf, 84.99; Lower Lake region, 88.74; Upper Lake region, 89.44; Tennessee and the Ohio valley, 86.66; upper Mississippi valley, 90.13; lower Missouri valley, 85.97.

The percentage of verification of the several elements is as follows: Weather, 90.35; wind-direction, 92.38; temperature, 88.12; and, barometer, 80.44.

Cautionary Signals.—Total number of storm-warnings sent, to both Canadian and United States shipping ports, during the month, is 203. 154 Cautionary Signals were displayed, of which 116 were fully justified by the occurrence of dangerous winds at or near the station; 5 were partly verified and 33 were not verified. Reports received at this office show that the Cautionary Signals ordered at the stations on the Gulf and south Atlantic coast previous to the cyclone were generally observed, and that the warning was given in ample time to enable interested parties to prepare for the storm.

ATMOSPHERIC ELECTRICITY.

(1.) *Thunder-storms.*—The most severe of these have already been noticed under the head of Local Storms. A general view shows that they have been most frequent in the upper Mississippi valley and on the Gulf coast.

(2.) *Auroras.*—The display of auroras has been unusually faint. The principal display occurring between the 43d and 47th degrees of latitude. The most marked occurred in the early portion of the month at Duluth, Escanaba, Eastport and Pembina. The most extended auroral display occurred on the 30th at Duluth, Alpena, Waterburgh and Albany, N. Y.

OPTICAL PHENOMENA.

(1.) *Solar Halos.*—The most prominent displays of this phenomenon occurred on the 12th and 16th, when they were observed in most of the States lying in a direct line from Maine to Louisiana, and on the 18th from New England to the Ohio valley and Michigan. They were observed in one or more States upon every day, except on the 1st, 4th and 11th, the principal (other than the above) being on the 3d, 9th, 10th, 13th, 14th, 15th, 29th and 30th.

(2.) *Lunar Halos.*—These phenomena were mostly observed from the 8th to the 18th, very few being reported from the 5th to the 8th, and from the 21st to the 29th; while none were observed from the 1st to the 4th; on the 7th, 19th, 20th, 25th; 26th, 27th and 30th. The most extensive occurred on the 9th—observed from New England to West Virginia, in Minn. and Fla.; on the 11th in Iowa, La., Mich., Ind., Ill., Penn., N. Y., Me. and Fla.; and during the 13th, 14th and 15th, from Newfoundland to the Gulf of Mexico and Texas, and in Dakota and Utah.

(3.) *Coronæ* were observed on the 9th at Norfolk, Va; on the 15th at Tybee Island, Ga.; on the 18th at Buffalo, N. Y., and Tybee, Ga; on the 21st, 22d, 23d, 27th and 26th, at Rochester, N. Y.; and on the 30th at Wood's Hole, Mass.

(4.) *Parhelia* was observed on the 14th at Houseville, N. Y.

(6.) *Mirage.*—This was observed on the 11th, 22d and 23d at New London, Conn., and frequently at Ellingwood, Kansas.

MISCELLANEOUS PHENOMENA.

(1.) *Zoological.*—*Grasshoppers* were reported at Denver, Colorado, from the 1st, to the 6th, and on the 17th, 18th, 20th, 21st, 22nd and 27th, in countless numbers, going eastward; at Hot Sulphur Springs, Col., from the 1st to the 8th, and from the 15th to the 30th; and at Las Vegas, N. M., from the 2nd to the 9th, and on the 15th. *Wild geese*, flying south, have been reported on the 11th, 15th, 16th and 22nd at Dubuque; on the 19th at Santa Agency, Neb.; on the 20th at North Platte, Neb.; on the 26th at Corsicana, Texas; and from the 27th to 29th, at Leesburg, Ind.; Fort Madison, Iowa; Houlton, Kan.; Mesquite, Texas, Yankton, Dak., and Breckenridge, Minn. *Wild ducks* were observed going south on the 11th, 15th, 16th and 22d at Dubuque, Iowa; and the 26th at Corsicana, Texas; and from the 27th to the 30th, at Yankton, Dak., and Atlantic City, N. J. *Cranes* were observed going south, on the 26th at Austin, Texas; on the 28th at Fort Madison, Iowa, and going west, on the 30th at Wilsonville, Ala. *Sea-gulls* were seen going south, on the 16th at Atlantic City, N. J. *Swallows* were last seen on the 4th, at West Charlotte, Virginia; on the 12th at Contoocookville, N. H.; on the 14th at Coalville, Utah; on the 21st at Ft. Union, New Mexico., and on the 28th at Morgantown, West Virginia. *Martins* were last seen on the 20th at Morgantown, West Virginia; the *Kingbird*, on the 6th at Contoocookville, N. H.; the *Hummingbird* on the 20th at West Charlotte, Vermont, and on the 23rd at Contoocookvile, N. H.; the *Fire fly* on the 25th at North Germantown, N. J. The *Oriole* was last heard on the 3rd at Contoocookville, N. H.; and the *Katydid* on the 25th at North Germantown, N. J. *Black birds* were seen on the 16th, at Ft. Union, N. M., and Coalville, Utah. *Dragon flies*, on the 20th and 21st at Indianola, Texas, going northwest. *Locusts* were observed at Cincinnati on the 1st. On the 30th hundreds of squirrels were reported emigrating across the James river at Lynchburg, Va., and on the 22d, snapping mackerel (blue fish) were reported going south at Cape May.

(2.) *Prairie fires* were reported near St. Paul on the 20th and 28th.

(3.) *Meteors.*—These were most frequently observed as follows: On the 4th in Connecticut, Ohio, Rhode, Island and New York; on the 5th in New York, Massachusetts and Iowa, and on the 26th in Michigan, Minnesota, Missouri and Connecticut; also in one or two States on the 1st, 3rd, and from the 6th to the 10th, 15th, and from the 19th to the 28th.

(4.) *Polar Bands.*—These were observed, on the 1st at South Bend, Ind.; on the 9th at Newport, R. I., and Long Branch, N. J.; on the 11th at Carthagena, O.; on the 14th at Iowa City, Iowa; on the 15th and 21st at Wytheville, Va.; on the 22nd at St. Paul, Minn., and on the 23rd at Wilmington, N. C.

(5.) *The Eclipse of the Sun*, which occurred on the 29th, was observed at Bangor, Me., Freehold, N. J., Gardiner, Me., Harbor Grace, N. F., Lenoir, N. C., Malone, N. Y., Mobile, Ala., Mt. Desert, Me., New Castle, Pa., Rochester, N. Y., Wendell, Mass., West Charlotte, Vt., and Woodlawn, Md.

PUBLISHED BY ORDER OF THE HON. WM. W. BELKNAP, SECRETARY OF WAR.

Albert J. Myer

Brig. Gen. (Bvt. Assg't.) Chief Signal Officer, U. S. A.

Copy furnished for

WAR DEPARTMENT V
SIGNAL SERVICE, U S
DIVISION OF TELEGRAMS AND REPORTS FOR THE BENE
TRACKS OF CENTRES OF LOW BAROMETE
VII
V
II
I
IV
VIII
VI
Ft. Benton
Bismarck
Duluth
Virginia City
Salt Lake City
Cheyenne
North Platte
Omaha
Denver
Pikes Peak
Santa Fe
San Diego
Galveston
Indianola
Shreveport
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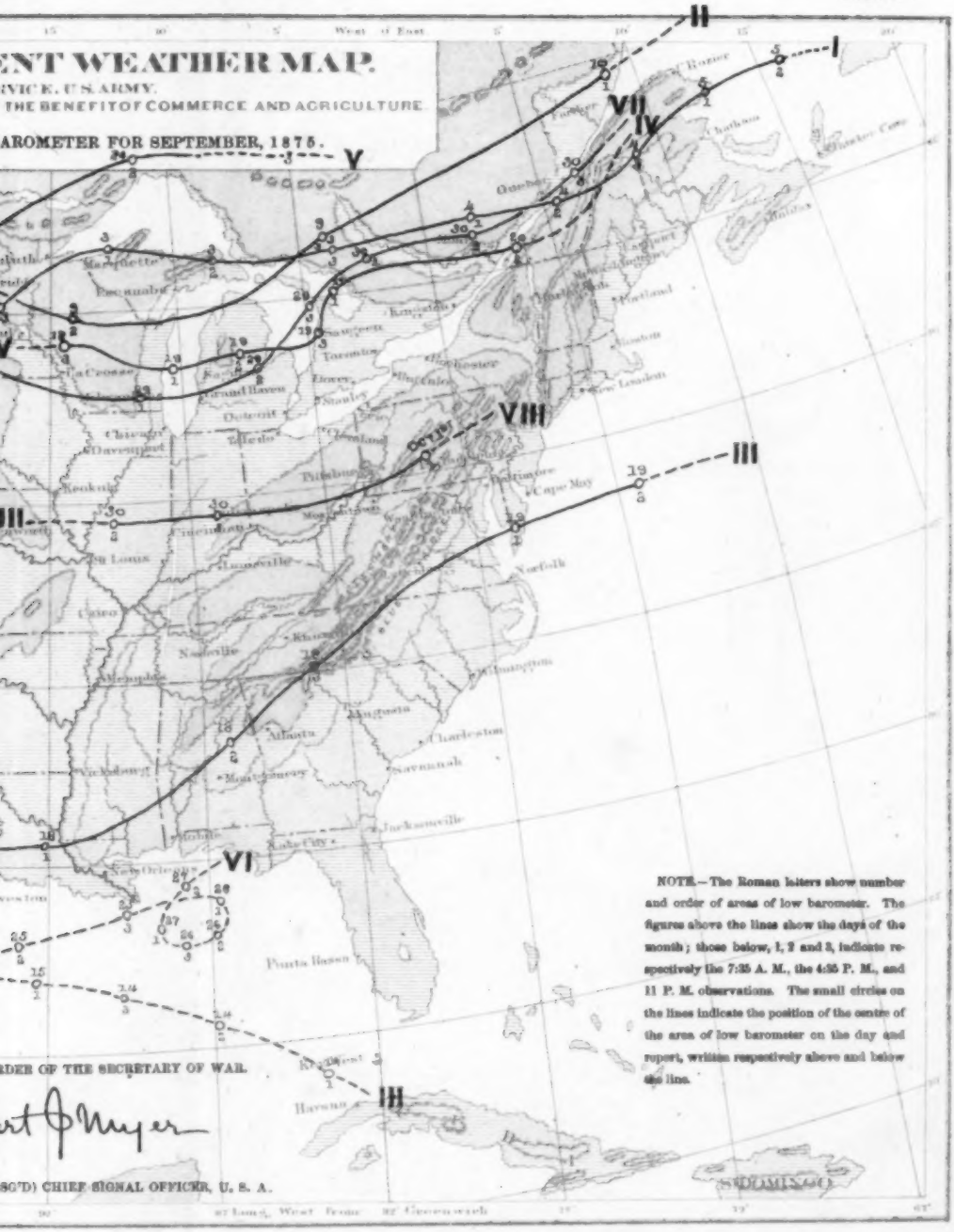
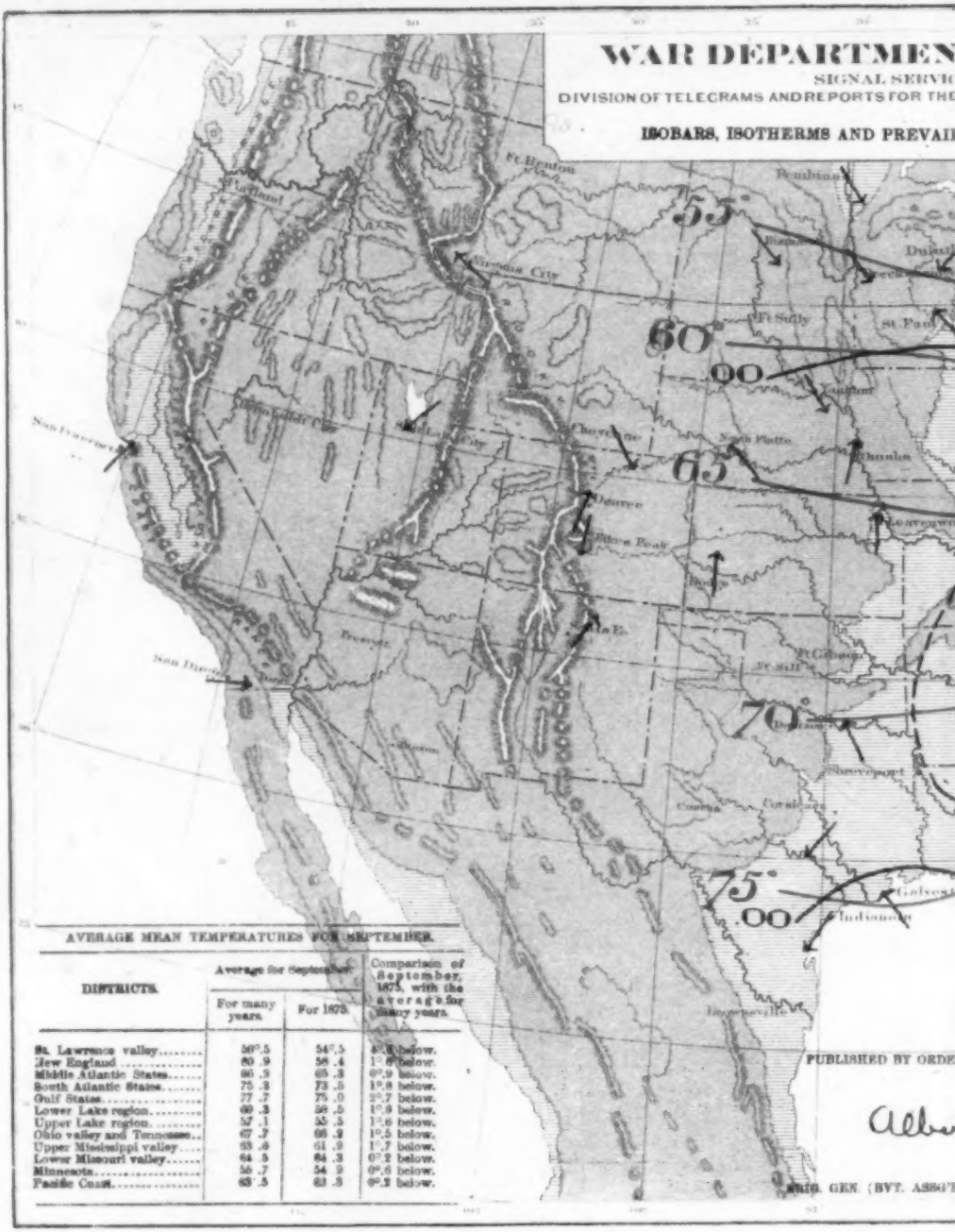
No. I.


ENT WEATHER MAP.
RVICE, U.S.ARMY.
THE BENEFIT OF COMMERCE AND AGRICULTURE.
AROMETER FOR SEPTEMBER, 1875.
I
II
III
IV
V
VI
VII
VIII
NOTE.—The Roman letters show number and order of areas of low barometer. The figures above the lines show the days of the month; those below, 1, 2 and 3, indicate respectively the 7:35 A. M., the 4:35 P. M., and 11 P. M. observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.
RDER OF THE SECRETARY OF WAR.
SG'D) CHIEF SIGNAL OFFICER, U. S. A.



AVERAGE MEAN TEMPERATURES FOR SEPTEMBER.

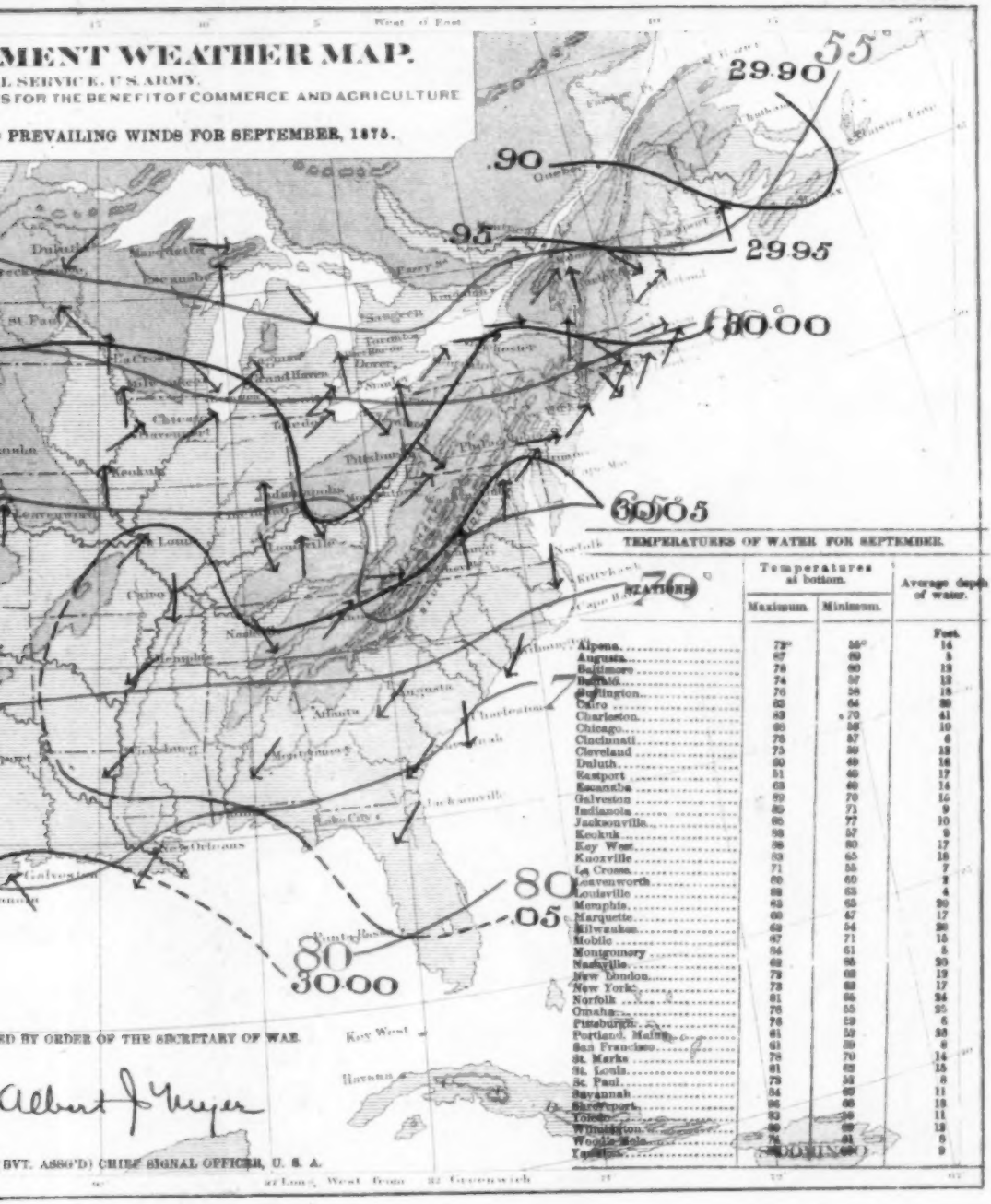
DISTRICTS.	Average for September		Comparison of September, 1875, with the average for many years.
	For many years.	For 1875.	
St. Lawrence valley	59°.5	54°.5	5°.0 below.
New England	60 .9	58 .4	1°.6 below.
Middle Atlantic States	66 .9	65 .3	0°.9 below.
South Atlantic States	75 .3	73 .5	1°.8 below.
Gulf States	77 .7	75 .0	2°.7 below.
Lower Lake region	60 .3	58 .5	1°.8 below.
Upper Lake region	57 .1	55 .5	1°.6 below.
Ohio valley and Tennessee	67 .7	66 .2	1°.5 below.
Upper Mississippi valley	63 .6	61 .9	1°.7 below.
Lower Missouri valley	64 .5	64 .3	0°.2 below.
Minnesota	56 .7	54 .9	0°.8 below.
Pacific Coast	63 .5	63 .3	0°.2 below.

MENT WEATHER MAP.

L SERVICE, U. S. ARMY.

S FOR THE BENEFIT OF COMMERCE AND AGRICULTURE

PREVAILING WINDS FOR SEPTEMBER, 1875.



TEMPERATURES OF WATER FOR SEPTEMBER.

STATIONS.	Temperatures at bottom. Maximum.	Minimum.	Average depth of water.
			Feet.
Alpena	72°	55°	14
Augusta	67	60	5
Baltimore	76	60	13
Buffalo	74	57	13
Burlington	76	58	18
Cairo	82	64	30
Charleston	83	70	41
Chicago	66	56	10
Cincinnati	76	57	6
Cleveland	75	59	13
Duluth	60	49	16
Eastport	51	46	17
Escanaba	63	46	14
Galveston	89	70	15
Indianola	89	71	9
Jacksonville	86	77	10
Keokuk	80	57	9
Key West	86	80	17
Knoxville	83	65	16
La Crosse	71	55	7
Leavenworth	80	60	7
Louisville	80	63	4
Memphis	83	65	30
Marquette	60	47	17
Milwaukee	62	54	30
Mobile	87	71	15
Montgomery	84	61	5
Nashville	69	65	20
New London	73	60	19
New York	73	69	17
Norfolk	81	65	24
Omaha	76	55	25
Pittsburgh	76	59	6
Portland, Maine	61	53	30
San Francisco	61	59	8
St. Marks	78	70	14
St. Louis	81	62	15
St. Paul	73	53	8
Savannah	84	67	11
Shreveport	93	68	18
Toledo	83	59	11
Wilmington	80	69	13
Woods Hole	74	61	6
Yankton	76	60	9

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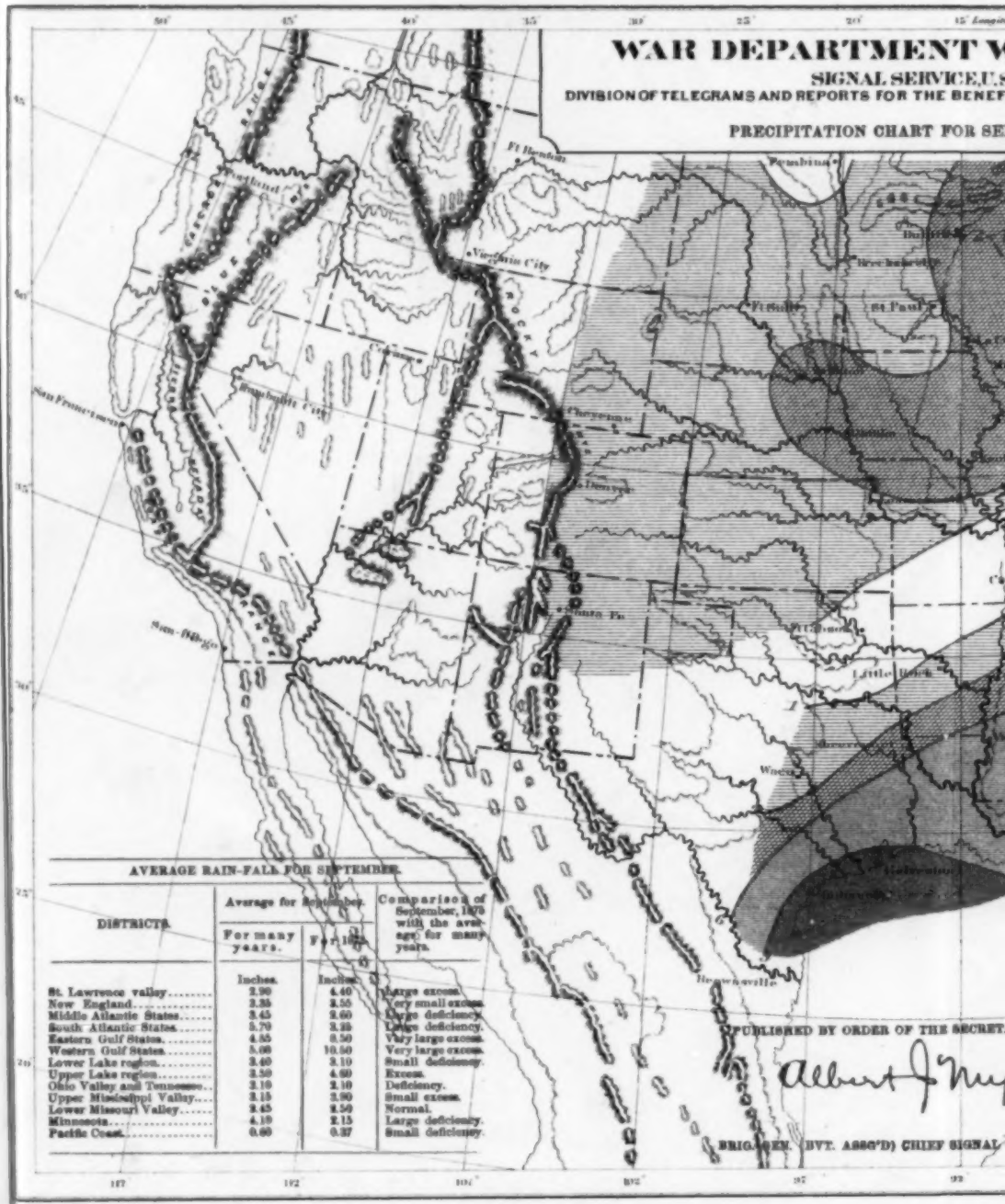
Albert J. Myer

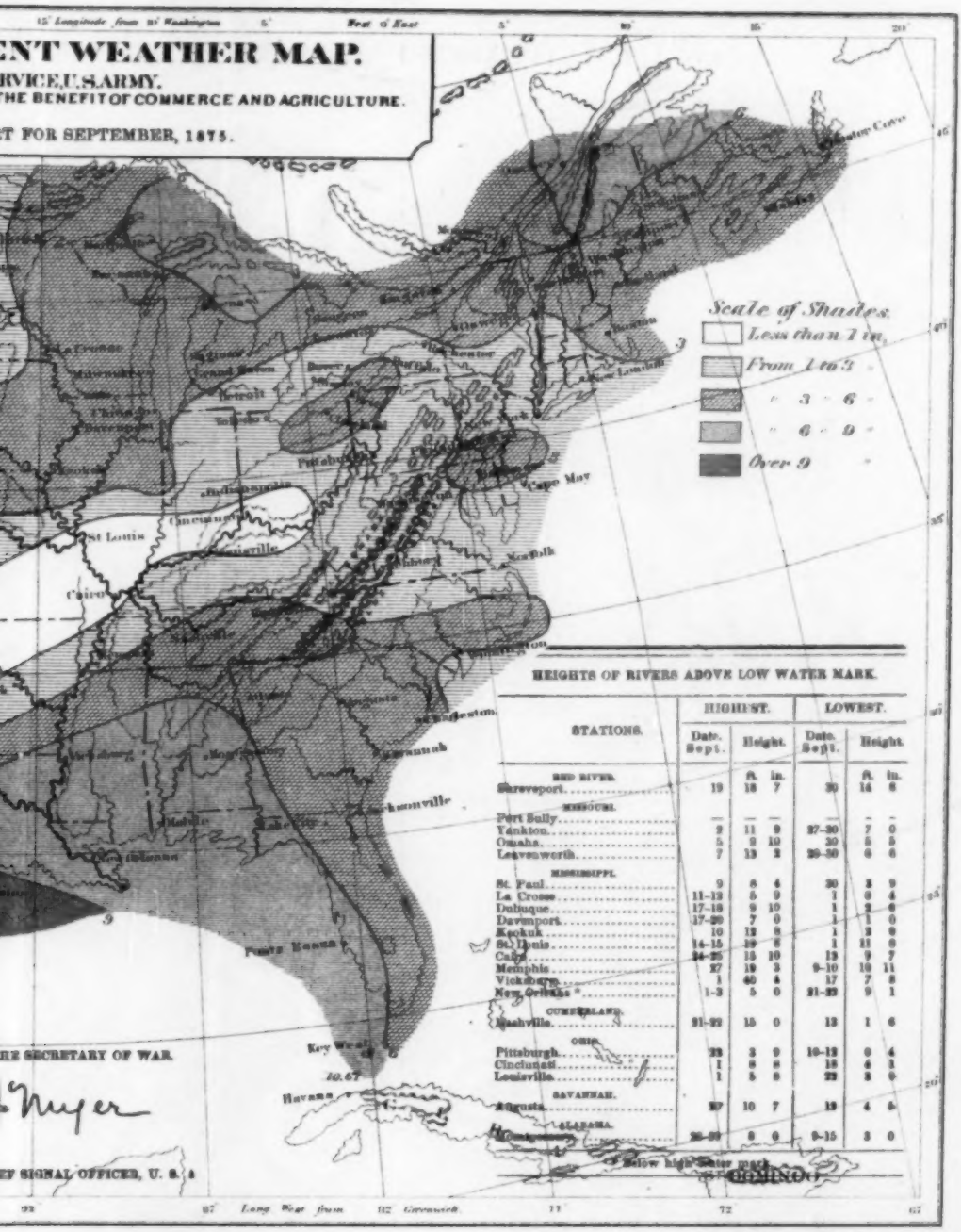
BVT. ASSG'D CHIEF SIGNAL OFFICER, U. S. A.



AVERAGE RAIN-FALL FOR SEPTEMBER.

DISTRICTS.	Average for September. For many years.	Average for September. For 1876.	Comparison of September, 1876 with the average for many years.
	Inches.	Inches.	
St. Lawrence valley	2.90	4.40	Large excess.
New England	3.35	3.55	Very small excess.
Middle Atlantic States	3.45	2.60	Large deficiency.
South Atlantic States	5.70	3.25	Large deficiency.
Eastern Gulf States	4.55	9.50	Very large excess.
Western Gulf States	5.00	10.50	Very large excess.
Lower Lake region	3.40	3.10	Small deficiency.
Upper Lake region	2.50	4.60	Excess.
Ohio Valley and Tennessee	3.10	2.10	Deficiency.
Upper Mississippi Valley	3.15	3.90	Small excess.
Lower Missouri Valley	2.45	2.50	Normal.
Minnesota	4.10	2.15	Large deficiency.
Pacific Coast	0.60	0.37	Small deficiency.

No. III.



H. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.